

What is claimed is:

1. A method of fabricating ceramics, comprising
a step of forming a ceramic film by feeding an
5 electromagnetic wave and an active species of a substance which
is at least part of raw materials for the ceramics to a
predetermined region.
2. The method of fabricating ceramics as defined in claim
10 1, wherein a film including a substance which is part of raw
materials for the ceramics is formed in the predetermined
region.
3. A method of fabricating ceramics, comprising
15 a step of feeding an active species and an electromagnetic
wave to a first ceramic film to form a second ceramic film which
has a crystal structure differing from the crystal structure
of the first ceramic film.
- 20 4. The method of fabricating ceramics as defined in claim
3, wherein the first ceramic film is formed of ceramics in an
amorphous state.
5. The method of fabricating ceramics as defined in claim
25 3, wherein the first ceramic film is formed of ceramics having
low crystallinity.

6. The method of fabricating ceramics as defined in claim
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wherein the active species of a substance which is at
least part of the raw materials for the ceramics is a radical,
5 an ion, or ozone obtained by activating a substance containing
oxygen or nitrogen.

7. The method of fabricating ceramics as defined in claim
3, wherein the active species is a radical or an ion obtained
10 by activating a substance containing oxygen or nitrogen.

8. The method of fabricating ceramics as defined in claim
1, wherein in addition to the active species, an ion obtained
by activating inert gas are also fed to the predetermined
15 region.

9. The method of fabricating ceramics as defined in claim
1, wherein the thickness of the ceramic film is 5 nm to 30 nm.

20 10. The method of fabricating ceramics as defined in claim
3, wherein the thickness of the second ceramic film is 5 nm to
30 nm.

11. A method of fabricating ceramics,
25 wherein a film having a predetermined thickness is formed
by repeating several times a step of forming a ceramic film
having a predetermined thickness by feeding at least one of an

electromagnetic wave and active species of a substance which is at least part of raw materials for the ceramics to a predetermined region.

5 12. The method of fabricating ceramics as defined in claim 11, wherein a film including a substance which is part of the raw materials for the ceramics is formed in the predetermined region.

10 13. The method of fabricating ceramics as defined in claim 11, wherein the thickness of the ceramic film is 5 nm to 30 nm.

14. The method of fabricating ceramics as defined in claim 11, wherein the ceramic film is formed on part of a substrate.

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15. A method of fabricating ceramics, comprising:
a first step of forming a first ceramic film; and
a second step of feeding at least one of an
electromagnetic wave and active species to the first ceramic
20 film to form a second ceramic film which has a crystal structure
differing from the crystal structure of the first ceramic film,
wherein a film having a predetermined thickness is formed
by performing alternately the first and second steps.

25 16. The method of fabricating ceramics as defined in claim 15, wherein the thickness of the first ceramic film is 5 nm to 30 nm.

17. The method of fabricating ceramics as defined in claim 15, wherein the first ceramic film is formed on part of a substrate.

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18. The method of fabricating ceramics as defined in claim 15, wherein the first ceramic film is formed of ceramics in an amorphous state.

10 19. The method of fabricating ceramics as defined in claim 15, wherein the first ceramic film is formed of ceramics having low crystallinity.

20. The method of fabricating ceramics as defined in claim 15 11,

wherein the active species of a substance which is at least part of the raw materials for the ceramics is a radical, an ion, or ozone obtained by activating a substance containing oxygen or nitrogen.

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21. The method of fabricating ceramics as defined in claim 15,

wherein the active species is a radical, an ion, or ozone obtained by activating a substance containing oxygen or 25 nitrogen.....

22. The method of fabricating ceramics as defined in claim

11, wherein in addition to the active species, ions obtained by activating inert gas is also fed to the predetermined region.

23. A method of fabricating ceramics,

5 wherein a region for forming a ceramic film is part of a substrate; and

the method comprising a step of forming the ceramic film by feeding at least one of an electromagnetic wave and active species of a substance which is at least part of raw materials
10 for the ceramics to a predetermined region.

24. The method of fabricating ceramics as defined in claim 23, wherein a film including a substance which is part of the raw materials for the ceramics is formed in the predetermined
15 region.

25. A method of fabricating ceramics,

wherein a region for forming a ceramic film is part of a substrate; and

20 the method comprising a step of feeding at least one of active species and an electromagnetic wave to a first ceramic film to form a second ceramic film which has a crystal structure differing from the crystal structure of the first ceramic film.

25 26. The method of fabricating ceramics as defined in claim 23, further comprising a step of:

forming a film-forming region having affinity to ceramics

to be formed and a non-film-forming region having no affinity to ceramics to be formed on a surface of the substrate, to form self-alignably a ceramic film in the film-forming region.

5 27. The method of fabricating ceramics as defined in claim 25, wherein the first ceramic film is formed of ceramics in an amorphous state.

28. The method of fabricating ceramics as defined in claim
10 25, wherein the first ceramic film is formed of ceramics having low crystallinity.

29. The method of fabricating ceramics as defined in claim 23,

15 wherein the active species of a substance which is at least part of the raw materials for the ceramics is a radical, an ion, or ozone obtained by activating a substance containing oxygen or nitrogen.

20 30. The method of fabricating ceramics as defined in claim 25, wherein the active species is a radical or an ion obtained by activating a substance containing oxygen or nitrogen.

31. The method of fabricating ceramics as defined in claim
25 23, wherein in addition to the active species, ions obtained by activating inert gas are fed to the predetermined region.

32. The method of fabricating ceramics as defined in claim 23, wherein the thickness of the ceramic film is 5 nm to 30 nm.

33. The method of fabricating ceramics as defined in claim 25, wherein the thickness of the second ceramic film is 5 nm to 30 nm.

34. The method of fabricating ceramics as defined in claim 23, wherein the step of forming the ceramics is repeated several times.

35. The method of fabricating ceramics as defined in claim 1, 3, 15, 23 or 25, wherein at least one of the active species and the electromagnetic wave is fed to part of a substrate.

36. The method of fabricating ceramics as defined in claim 35, wherein the substrate is relatively moved when at least one of the active species and the electromagnetic wave is fed to the part of the substrate.

37. The method of fabricating ceramics as defined in claim 3, 15 or 25, wherein the first ceramic film is formed by a coating method, the liquid source misted chemical deposition (LSMCD), the chemical vapor deposition (CVD), or a sputtering method.

38. The method of fabricating ceramics as defined in claim 37, wherein the first ceramic film is formed by LSMCD or CVD.

5 39. The method of fabricating ceramics as defined in claim 1, 3, 15, 23 or 25,

wherein the ceramic film or the second ceramic film is formed of ferroelectrics.

10 40. The method of fabricating ceramics as defined in claim 1, 3, 15, 23 or 25,

wherein the ceramic film or the second ceramic film is formed at a temperature of less than 600°C.

15 41. A ceramics fabrication device, comprising:

a base of a substrate on which ceramics is formed;

a heating section;

an active species feeder which feeds active species of a substance which is at least part of raw materials for the ceramics; and

20 an electromagnetic wave generating section which provides an electromagnetic wave,

wherein at least one of the active species and the electromagnetic wave is fed to a region for forming the ceramics.

25 42. The ceramics fabrication device as defined in claim 41,

further comprising

a film forming section which forms a ceramic film or a film including a substance which is part of the raw materials for the ceramics, in a chamber.

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43. A ceramics fabrication device, comprising:

a crystallization section which has a base of a substrate on which ceramics is formed, a heating section, an active species feeder which feeds active species of a substance which is at least part of raw materials for the ceramics, and an electromagnetic wave generating section which provides an electromagnetic wave, to feed at least one of the active species and the electromagnetic wave to a region for forming the ceramics; and

15 a film forming section which is formed in a chamber differing from the chamber of the crystallization section.

44. The ceramics fabrication device as defined in claim 43, further comprising a load-lock section between the crystallization section and the film forming section.

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45. The ceramics fabrication device as defined in claim 41 or 43, wherein the base of the substrate functions as the heating section.

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46. The ceramics fabrication device as defined in claim 41 or 43,

wherein at least one of the active species feeder and the electromagnetic wave generating section feeds at least one of the active species and the electromagnetic wave to part of the substrate.

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47. The ceramics fabrication device as defined in claim 46, wherein the substrate is relatively moved when at least one of the active species and the electromagnetic wave is fed to the part of the substrate.

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48. The device for fabricating ceramics as defined in claim 43,

wherein the film forming section forms a film by a coating method, the liquid source misted chemical deposition (LSMCD),
15 the chemical vapor deposition (CVD), or a sputtering method.

49. The device for fabricating ceramics as defined in claim 48, wherein the film forming section forms a film by LSMCD or CVD.

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50. A semiconductor device comprising a capacitor which includes a dielectric film formed by the fabrication method as defined in any one of claims 1 to 40.

25 51. A piezoelectric device comprising a dielectric film formed by the fabrication method as defined in any one of claims 1 to 40.